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KENYON & KENYON
ONE BROADWAY
NEW YORK, NY 10004

EXAMINER
AHMED, SHAMIM

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Paper No. 16

Application Number: 09/581,663
Filing Date: August 03, 2000
Appellant(s): BECKER ET AL.

Richard L. Mayer
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 3/26/03.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences, which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

Appellant's brief includes a statement that claims 33,34,36-38 and 62 do not stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

5,313,836	FUJII et al	5/1994

6,211,092	TANG et al.	4/2001
4,310,380	FLAMM et al	1/1982

WOLF et al, "Silicon Processing For The VLSI ERA" 1986, Vol.1, pages 539-550

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 33,36-38 and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al (5,313,836) in view of Wolf (Silicon Processing For the VLSI ERA) and further in view of Tang et al (6,211,092).

Fujii et al disclose a method for manufacturing a semiconductor sensor, wherein a silicon substrate is etched to form trenches using silicon oxide as a mask.

Fujii et al also disclose that separating layers (108,104) are etched in a second etching process and finally a third etching is performed to etch a further silicon layer to form a free-standing structure (col.6, lines 37-51 and figures 3G-3H).

Fujii et al fail to teach the etching using a dry chemical treatment such as plasma etching instead of a wet etching.

However, Wolf et al teach that dry etching has important manufacturing advantage of eliminating handling, consumption and disposal of relatively large quantities of dangerous acids and solvent used in wet etching (page 539).

Wolf et al also teach that etching gas can be used SF_6 or CF_4 and occasionally oxygen can be added to increase the etching rate of silicon (see table on page 546 and pages 549).

It would have been obvious to one skill in the art to replace Fujii et al's wet etching with a dry etching process for eliminating handling, consumption and disposal of relatively large quantities of dangerous acids and solvent used in wet etching as taught by Wolf et al.

Modified Fujii et al fail to teach the introduction of a polymer forming monomer into the etching process. It is known in the art that any fluoro or chloro carbon - containing etching gas will form polymer in the side- wall of the trench.

In addition, Tang et al disclose an etching process, wherein a polymer forming gas such as C_4F_8 is introduced for etch selectivity (col.5, lines 55-65 and col.6, lines 6-15) and also for providing side-wall passivation and thereby reducing bowing of the via hole or the trench (col.9, lines 52-59).

As to claim 38, it would have been obvious that the ionic bombardment will prevents the formation of the polymer film on the locations accessible for perpendicular ion incidence because all the constituents are similar as the claimed invention.

As to claim 62, Tang et al teach that oxygen interacts with the carbon of the polymer to form volatile carbon monoxide, which is eventually removed from the etching chamber and also teach that oxygen plasma can be used to efficiently remove polymer material (col.10, lines 9-13).

Therefore, it would have been obvious to one skill in the art to combine Tang et al's teaching into Fujii et al's modified method to increase the etch selectivity and also to reduce bowing of the trenchs as taught by Tang et al.

Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al (5,313,836) in view of Wolf (Silicon Processing For the VLSI ERA) and Tang et al (6,211,092) as applied to claims 33,36-38 above, and further in view of Flamm et al (4,310,380).

Modified Fulii et al discussed above in the paragraphs above but fail to teach the silicon substrate is isotropically etched using a fluorine- containing etching gas as the context of claim 34.

However, Flamm et al teach that fluorine-containing gas such as chlorine trifluoride or bromine trifluoride is used to etch silicon isotropically at uniform and relatively high etching rate with respect to other such as silicon oxide (col.1, lines 62-67, col.7, lines 16-32).

Therefore, it would have been obvious to one skilled in the art at the time of claimed invention to employ Flamm et al's teaching into modified Fujii et al's method for uniform and selective etching of silicon as taught by Flamm et al.

By doing so, one could have a high etching rate at a relatively lower power levels and higher selectivity with excellent uniformity as taught by Flamm et al.

(11) Response to Argument

With respect to the 112, second paragraph rejection to claims 36-38 is withdrawn, as the appellant's argument is persuasive.

As to the claims 33,36-38 and 62, appellants argue that the examiner's general statement "any fluoro or chloro carbon-containing etching gas will form polymer in the sidewall of the trench" is unsupported.

In response, examiner withdraws the general statement as the statement does not hold any patentability, whereas, the claims are still rejected under modified Fujii et al in view of Tang et al.

Examiner also states that Tang et al disclose an etching process, wherein a polymer forming gas such as C_4F_8 is introduced for etch selectivity and also for providing sidewall passivation of the via hole or trench (col.5, lines 55-56, col.6, lines 6-15 and col.9, lines 52-59).

Appellants also argue that etching process taught by Tang et al are completely incompatible with the etching process disclosed in Fujii et al because it is unreasonable to combine Tang et al's etching process with the wet etching technique of Fujii et al.

In response, examiner states that Fujii et al's wet process is modified with Wolf et al's teaching of using dry etching over wet etching with important manufacturing advantage of eliminating handling, consumption and disposal of dangerous acids and solvent used in wet processing (see table on page 546 and 549 of Wolf et al).

Therefore, modified Fujii et al is compatible with the Tang et al's dry etching process.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Shamim Ahmed
Examiner
Art Unit 1765

SA
June 5, 2003

Conferees
Glenn Caldarola

Benjamin Utech

BENJAMIN L. UTECH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

KENYON & KENYON
ONE BROADWAY
NEW YORK, NY 10004

Glenn Caldarola
Supervisory Patent Examiner
Technology Center 1700